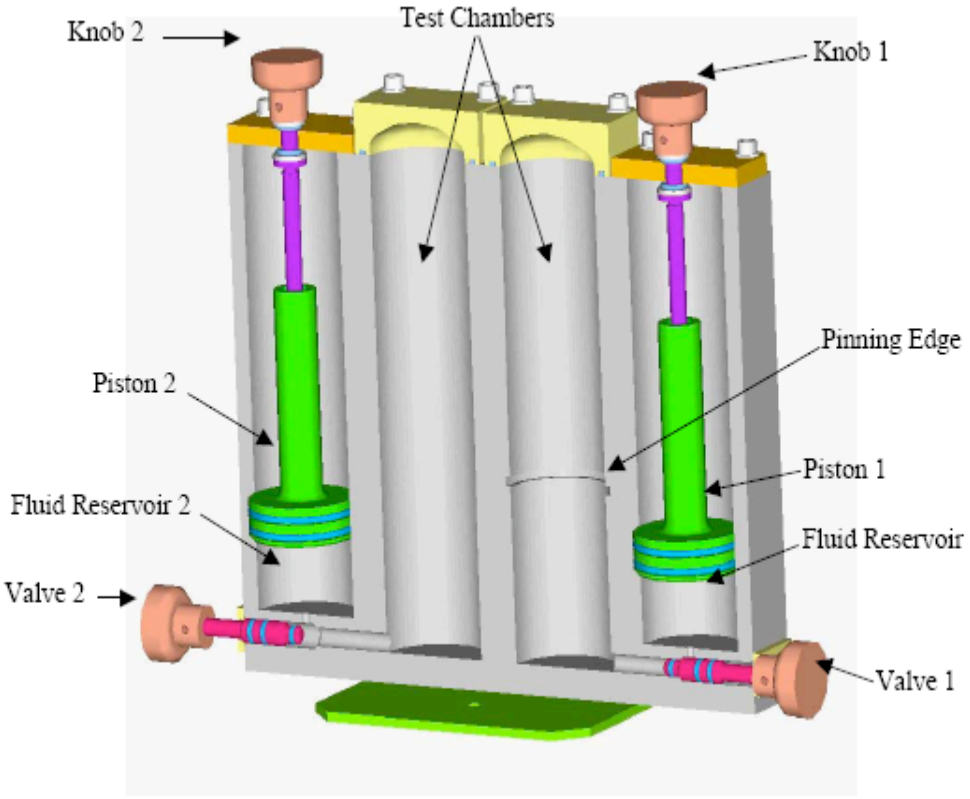
Glenn Research Center

Contact Line 1&2

CFE

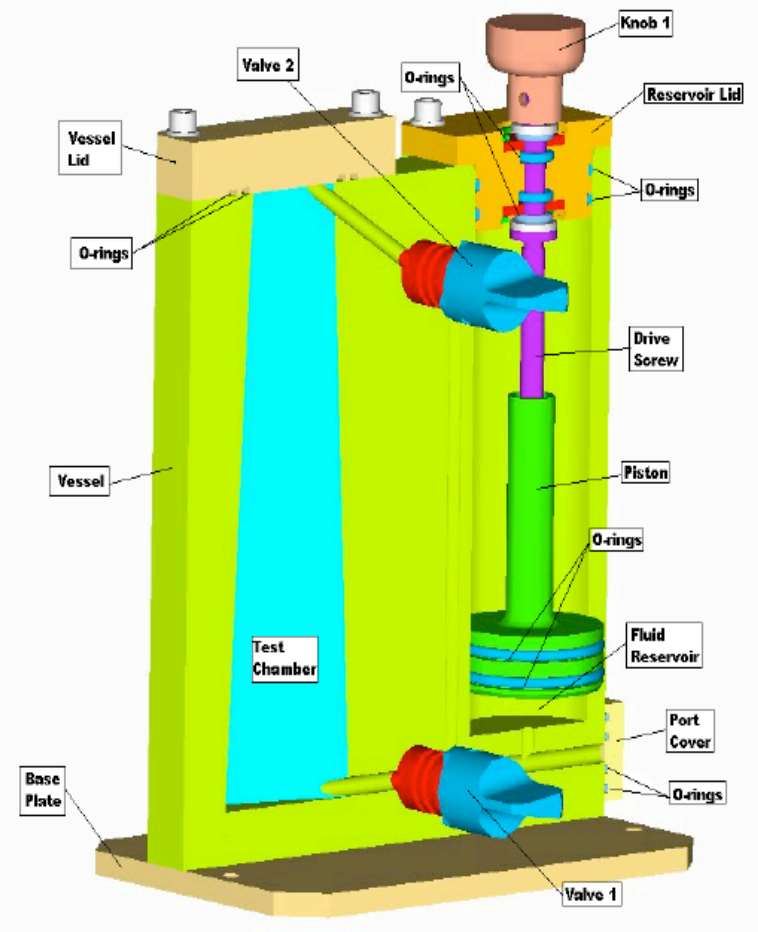


The CL experiment "run" procedure is generally processed as follows:

1. All valves initially closed.
2. Slowly open Valve 2 to allow the fluid (< 45 cc, 2 cSt Silicone oil), to dispense from reservoir into the base of the test chamber using Knob 2 turning at a rate of approximately 0.5 rev/sec. With no contact to payload, verbally record any observations.
3. Slowly open Valve 1 to all the fluid (also < 45 cc, 2 cSt Silicone oil), to dispense from reservoir into the base of the test chamber using Knob 1 turning at a rate of approximately 0.5 rev/sec. With no contact to payload, verbally record any observations.
4. Testing continues to include crew induced disturbances from gentle taps using a finger, to light pushes necessary to impart larger disturbances in amplitude. Nominal science is completed after shaking the units (to form bubbles in the oil), and allowing the bubbles to coalesce.

Interior Corner Flow 1&2

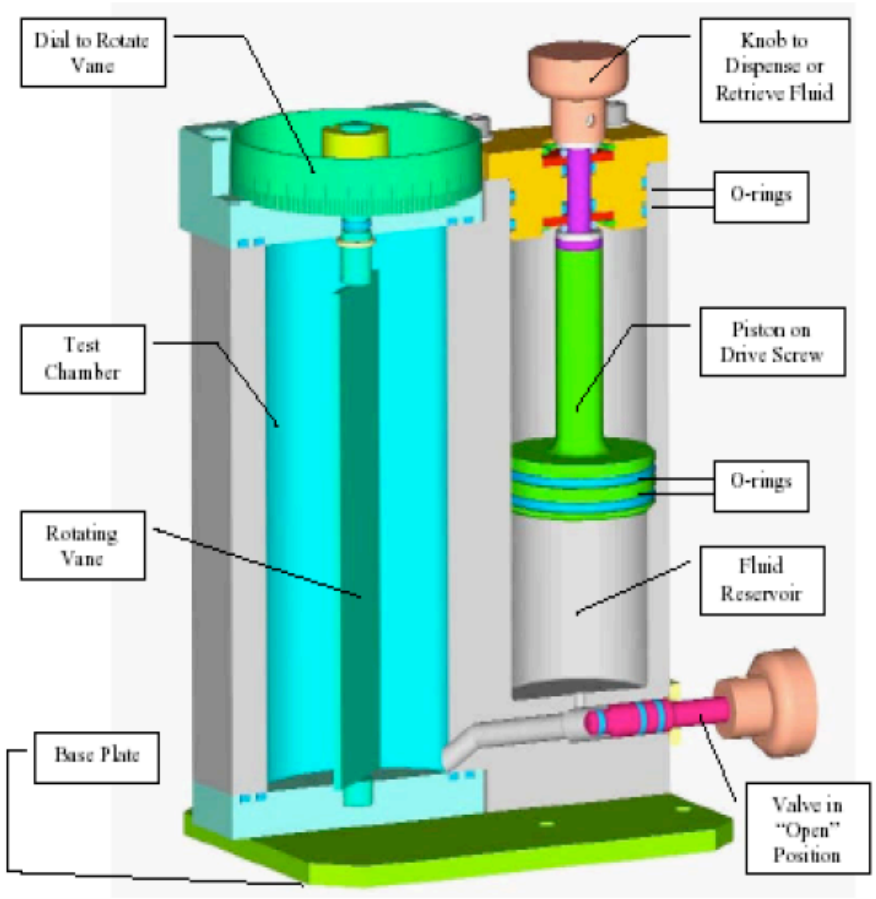
CFE



For both ICF units, the silicone oil fluid is delivered from a fluid reservoir to the base of the tapered test chambers.

1. Initial Fill. In the low-g environment the liquid will imbibe (absorb/distribute) throughout the container. This and the processes to follow are captured on video.
2. After the initial imbibition is complete (fluid shifts to top of container and equilibrates), the apparatus should then be able to repeat the previous test up to three times. The first test results in a flow over initially dry surfaces that cannot be repeated, but all subsequent repeat runs of the device will provide valuable data for pre-wet flow conditions which replicates a most common flow condition.
3. The apparatus should then be used to repeat the tests performed in Step 2 above, but allowing for a bypass tube connecting the base of the tapered container with the top of the container. The tests conducted with such a bypass line open simulate certain applications in microgravity fluids management systems and will provide another unique comparison opportunity for the theory established at present as fluid imbibes within the container as well as is drawn through the bypass line.
4. With the prescribed amount of fluid in the test chamber, bubbles should be generated in the chamber by 'shaking' the container. The container should be replaced for video photography and the passive imbibition, phase separation and coalescence phenomena recorded. Such tests should be repeated at least once and several tests performed for a variety of bubble densities/sizes and distributions.

Vane Gap 1&2
CFE



The third type of container, known as VG, has a test chamber with an elliptical cross section with an enclosed movable vane. CFE VG1 has a thin vane and CFE VG2 has a thick vane. Both modules are addressed by this PIA.

Two VG units are needed for the experiment to identify the impact of wetting on the critical wetting phenomena. The two units are identical except for the wetting condition and vane dimensions: CFE VG1 is uncoated. CFE VG2 is coated. The general experiment procedures for both vessels are identical and include:

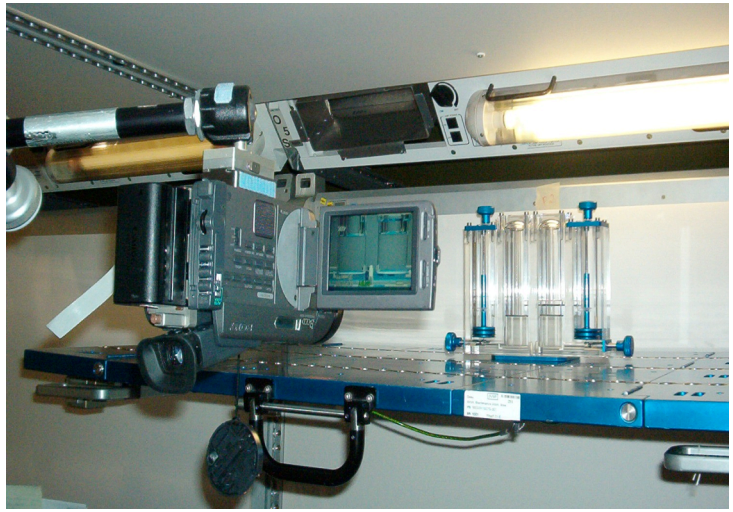
1. A prescribed amount of liquid is dispensed from a reservoir into an elliptic cross-sectioned cylindrical container in the low-g environment.
2. The vane is then rotated clockwise through one complete revolution (360 deg) in prescribed degree increments. The response of the fluid interface is recorded by video.
3. At each increment of vane rotation, time (approximately 30s) is allowed for the interface to establish equilibrium. Small perturbations (by hand, i.e., finger taps) to the container should be employed to assure local equilibrium is established.
4. The vane rotation procedure is then reversed (counter clockwise) with identical increments and perturbations for the equilibrium surfaces.
5. The clockwise/counter clockwise rotation is repeated up to three times.

CFE Operations in Destiny Module on MWA

Mike Fincke operating Contact Line 2.

Sony PD 100 Camcorder

Maintenance Work Area (MWA)



Operations Overview
CFE

CFE Setup

- Set up MWA
- Inspect for leakage
- Remove CFE from bags and mount to MWA
- Set up camera

Run Experiment

- CL – background, tap, push, slide 1 and 2, swirl, displacement, bubbles
- ICF – dry surface, pre-wet surface, loop, slosh and bubbles, bubbles centrifugal
- VG – background, dry Clockwise (CW), wet Counterclockwise (CCW), 720 continuous CW, 720 continuous CCW

CFE Teardown

- Return MWA and Camera to pre-CFE condition
- Return vessel to bags and re-stow

CFE operations are repeatable, with exception of initial run for each unit.
Downlink is a request for the initial run of every CFE unit.

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On-Orbit Operations
CFE

NASA Image: - Expedition 13 Science Officer Jeff Williams performing CFE CL2 Slide [slosh] disturbance modes.

NASA Image: - Expedition 9 Science Officer Mike Fincke performing CFE CL2 initial fill tests.